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Spoken Parentheticals in Instructional Discourse in STEM and Non-STEM Disciplines

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Abstract
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Comments
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Spoken Parentheticals in Instructional Discourse in STEM and Non-STEM Disciplines

The Interaction of the Prosodic, Ideational, and Interpersonal Resources in Signaling Information Structure

By Tammy Slater,[1] John Levis, and Greta Muller Levis, Iowa State University

Parentheticals, information that is not directly relevant to the topic being addressed, appear in all academic lectures and help listeners distinguish important from less important information. Their use is a critical skill for all teachers. Despite their importance, research on parentheticals in teaching is scarce. This chapter explores the instructional discourse of native English-speaking teaching assistants and international teaching assistants regarding the use of parentheticals, primarily in terms of the intonational and informational patterns they exhibit. Our analysis involved discourse data collected from sixteen classes, eight from chemistry (four taught by native English-speaking TAs and four taught by ITAs) and eight from English (also four taught by TAs and four by ITAs). While our study suggested that parentheticals can be used to connect the teacher and students interpersonally, and to break up the density of the lecture, we uncovered interesting differences between TAs and ITAs. Our

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findings suggest that ITAs may need to learn how to use parentheticals and prosody to break up the density of their lectures. Moreover, by not incorporating parentheticals well, ITAs may come across as unmoving, overly knowledgeable, and even unapproachable. Educators can use these findings to help ITAs better construct a logical hierarchy of information in extended discourse.

Distinguishing important from less important information in a lecture is a critical skill for all teachers. It is frequently achieved through the use of prosody to signal the relative importance of the information being presented. Focused syllables (e.g., *Now THIS is a critical point*) are one key resource to signal importance, but other prosodic strategies are also employed. One of these strategies involves the use of spoken parenthetical utterances. Parentheticals are "expressions that are linearly represented in a given string of utterance (a host sentence), but seem structurally independent" (Dehé & Kavalova, 2007, p. 1). They are said to be marked by special prosody (Bing, 1980). They also provide information that is not directly relevant to the main topic. Intonationally and informationally, parenthetical information is unusual. Our chapter is an exploration of parentheticals in teaching in STEM (Science, Technology, Engineering, Mathematics) and non-STEM fields. These two general areas commonly employ a large number of graduate instructors at North American universities.

Literature Review

Why study parentheticals in instructional discourse? This chapter came about because of our previous study (Levis, Levis, & Slater, 2012) on how Chinese, Indian, and American teaching assistants (TAs) turned content from a beginning physics textbook into the spoken language needed to teach the content. We used a simulated micro-teaching environment in which TAs got a short text and 20 minutes to prepare. They then were filmed teaching the topic in a room with a blackboard, a camera, and one researcher. We discovered that in addition to their use of sentence focus to highlight new information and de-stressing to mark old (given) information, TAs (especially the American TAs) also used parenthetical intonation, with a relatively flat, low pitch, often over extended stretches of text. American TAs frequently used this strategy to give informa-

tion about future classes, in asides that raised topics outside the content of the presentation, in interpersonal connections to their imagined audience, and in a kind of spoken internal commentary on what they were teaching. Given that there was no class present, this surprised us.

Most of the literature on parentheticals in speech that was available at that time (e.g., Bing, 1980; Bolinger, 1989; Ladd, 1980) suggested that typical parentheticals were only a few words long and limited in scope. Early discussion of parentheticals characterized them as quite short, expressing commentary on others (e.g., *He's gone, the jerk*), reflecting differences in politeness strategies (e.g., *I'd like that, please*.) or describing the speech of a narrator in the discourse (e.g., *I'm coming, she said*.). Parenthethicals in the examples here are underlined. However, we heard something different. Parentheticals were often long and varied in form and function. For example, one of the ways in which American TAs used parenthetical intonation was to give information on what future lectures would include, even though they knew they would not be giving such lectures, as in (1). The parenthetical information is underlined.

(1) and well electric energy /the main way that this is produced then is from Farriday's law / and we'll look at this a little later in the class cause this is a little more complicated / but there's other ways to produce / electric energy too /

The TAs also used parentheticals to make connections to the lives that the imagined students are presumed to be leading, as in (2), where the TA talks about driving with cell-phones and playing video games.

(2) Now electric energy / umm this is what lights our homes / and it's used for like our everyday appliances and conveniences / and sometimes when I see people driving on the road with their cell phones I kind of wonder why we're even using electric energy /cause not all the forms I guess are that great / but umm / it's also used in like video games and stuff /and I think that's why half of you don't show up some of the time /

Indian and Chinese TAs also used parentheticals, but not in the same ways and not with the same prosodic clues. This raised a question for us: How would parentheticals occur in actual teaching? The

differing use of parentheticals in our previous study also raised the question of whether there are differences between Native Teaching Assistants (NTA) and International Teaching Assistants (ITAs). In this study, NTAs were all American native speakers of English and ITAs were all speakers of other languages learned before English.

Our goal, then, is to determine whether NTAs and ITAs used parentheticals differently. In examining this, we are placing our study within a tradition in ITA research that has demonstrated differences in many areas, not only with pronunciation, but also with grammar and its role in making information accessible (e.g., Tyler, 1992). Research comparing the oral proficiency of NTAs and ITAs has analyzed grammatical and discourse competence, intonation (e.g., Kang, 2010; Levis, Levis, & Slater, 2012; Pickering, 2004), differences in cultural views on teaching, classroom roles, and life outside the classroom (Gorsuch, 2003; Myles & Cheng, 2003), and differences in expectations by the listener (Damron, 2000; Rubin, Ainsworth, Cho, Turk & Winn, 1998). While these studies have demonstrated the differences between NTAs and ITAs, and thus the potential issues involved in students learning from teaching assistants, no studies have examined the use of parentheticals.

What are parentheticals? Parentheticals are clausal or subclausal units that are "wedged in" a host sentence or "tagged on at the end" (Bolinger, 1989, p. 185), perhaps carrying some interpretation to the host sentence, as in (3) from Bolinger (1989, p. 186). Parentheticals are underlined.

(3) When the opportunity comes, and it will, **I'll bet**, sooner than you expect, you've got to be ready to grab it.

The host sentence here is *When the opportunity comes, you've got to be ready to grab it* and two parentheticals interrupt the host: a longer one, *and it will sooner than you expect* and ***I'll bet*** which interrupts the longer parenthetical. In this parenthetical, the interruption within the host would be marked prosodically by features such as lower pitch, lack of sentence focus, and greater tempo. However, none of these features are essential in every parenthetical (Dehé & Kavalova, 2007). In fact, very little about parentheticals is always true. Parentheticals can be defined syntactically (Kaltenböck, 2006) or prosodically (Bolinger, 1989; Dehé, 2007) but attempts

to come up with watertight definitions have been unsuccessful.

Semantically and pragmatically, parentheticals are just as varied. They seem to create a parallel level of information and thus evoke a parallel level of informational processing. They do not always contribute to the meaning of their hosts, especially when they are discourse-oriented. They are, in the words of Dehé and Kavalova (2007, p. 1), "a motley crew" of structures that do not all share the same syntactic, prosodic, or semantic features.

This chapter is motivated by our belief that parentheticals are far more common in spoken language, even in the relatively formal language found in the classroom, than the amount of research done on them would suggest. Syntactically, they vary widely. Prosodically, they are of interest in the way that they structure information in parallel to the main discourse. Semantically and pragmatically, they function in ways that are barely explored, but which are likely to be critical in how information is interpreted as being central or peripheral to the topics being discussed. The use of parentheticals also suggests that the discourse of teaching may be more complex than previously thought. This chapter thus uses two analytical frameworks to examine the prosodic and informational characteristics of parentheticals uttered by NTAs and ITAs, as explained in the following section.

Research Questions and Frameworks for Analysis

Our study explores two research questions, one having to do with a prosodic analysis and one having to do with an informational analysis.

1. What are the differences in how prosodic parentheticals are employed by NTAs and ITAs in our study?
2. What are the differences in how informational parentheticals are employed by NTAs and ITAs in our study?

To look at how prosodic parentheticals were used in STEM and non-STEM teaching (RQ #1), we listened to recordings from one day of eight TAs' classes (four NTAs and four ITAs) and identified the elements of their oral discourse that fit the prosodic characteristics associated with parentheticals. Two of the researchers listened

to these together, and after every two to four minutes, compared their identifications of parentheticals. To identify prosodic parentheticals, we listened for the most commonly cited features in the research literature: low level pitch, lack of pitch accents within the tone units, level or rising pitch at the end, increased tempo, and decreased volume. Prosodic parentheticals rarely had all of these features, although NTA productions usually had more of these features than ITA productions. Where there were disagreements, we listened or watched again, then discussed until agreement was reached. Later, we went back and classified each parenthetical in terms of its general purpose. Because parentheticals are so varied in prosody (Dehé, 2007, p. 262), and because no other work that we have seen has explored how prosodic parentheticals function in discourse, our analysis of prosodic parentheticals is exploratory.

To respond to the question of how parentheticals connect to the utterances around them (RQ #2), we drew from systemic functional linguistics, a theory of language in context, which views language as a system of meaning-making potential where language enacts the various functions that humans carry out (Halliday, 2004). The TAs in our study used their linguistic systems (their meaning-making potential) to produce specific instances of spoken texts to help their students learn the content being taught. Each text can be examined through three metafunctions: the ideational, the interpersonal, and the textual. See Table 1.

Table 1. Metafunctions in Systemic Functional Linguistics

Ideational	**Resources for construing experience**
Interpersonal	Resources for construing relationships
Textual	Resources for presenting ideational and interpersonal meanings as a flow of information in texts

Identifying the ideational, interpersonal, and textual resources that the TAs use parenthetically and non-parenthetically may thus provide information about connections to and differences from hosts at the clausal level. Clauses are typically joined together to form clause complexes (sentences), which in turn are integrated into logical stretches of meanings. We used two fundamental types

of logico-semantic relationships for our investigation: projection and expansion. See Table 2.

Table 2. Projection and Expansion

Logico-semantic relationship	Specific functions	Linguistic features
Projection	Ideas	Events of saying ("I think that")
	Locutions	Events of thinking ("He said that")
Expansion of prior text	Elaboration	Clarification, restatement, exemplification
	Extension	Addition or contrast
	Enhancement	Qualification or modification with temporal, spatial, causal, or conditional detail

Eggins and Slade (1997) extended these ideas to look at relationships between moves and their sequels in casual conversation. We have adopted Eggins and Slade's ideas to examine the function of parentheticals at the discourse level, looking at what they refer to as "sustaining moves" (p. 195), or moves that allow the speaker to continue speaking. Within the category of sustaining moves are "monitoring" moves, "in which the speaker focuses on the state of the interactive situation, for example by checking that the audience is following" (p. 195), and "prolonging" moves, which involve the three logico-semantic categories of expansion identified by Halliday and described in Table 2.

Method

Participants

Sixteen classes were videotaped and audiotaped, eight from chemistry and eight from English. These disciplines were chosen because they commonly employ NTA and ITA graduate instructors who teach their own classes, and because they are disciplines that are distinct in the way they represent STEM and non-STEM based knowledge. Within each discipline, we recorded two classes taught by two experienced NTAs and two taught by experienced ITAs. The classes taught were on similar topics at about the same time within the disciplines. See Table 3.

Table 3. Native Teaching Assistant (NTA) and International Teaching Assistant (ITA) Participants

	Chemistry		English	
	Name	*Number of classes*	*Name*	*Number of classes*
NTA	Amy[1]	2	Ellen	2
	Peter	2	Tim	2
ITA	Ajith (Hindi)[2]	2	Lihua (Chinese)	2
	Hamed (Arabic)	2	Feng (Vietnamese)	2

Analyses

To answer RQ #1, we looked at differences in how prosodic parentheticals were employed by NTAs and ITAs in our study. To answer RQ #2, we examined differences in how informational parentheticals were employed by NTAs and ITAs in our study. After the recordings of the NTAs and ITAs were transcribed, one researcher read through the transcripts to identify utterances that appeared to be parenthetical only by their placement in the transcripts. This researcher did not listen to the NTAs' and ITAs' recordings while identifying informational parentheticals.

Our separate identification of prosodic and informational parentheticals was intended to address two potential drawbacks of transcribed talk (Halliday, 2004). The first is the omission of intonation and rhythm. To address the first drawback, two researchers followed the transcripts while watching and/or listening to the recordings, and they marked utterances that had the prosody associated with parenthetical utterances. The second drawback is that of "commission," where talk is normalized to make it appear "as though it had been composed in writing" (p. 33). In our study, we transcribed the data in tone groups, without punctuation, thereby addressing the second drawback.

Informational and prosodic parentheticals were then classified into linguistic functions (as per Eggins & Slade, 1997; Halliday, 2004) and into themes of purpose that emerged from the data. A consideration of both types of classification allowed us to better

2. All names in this study are pseudonyms.
3. Indicates the first language of ITA participants, if not English.

inform ITA pedagogy because parentheticals may be both informational and prosodic, but they do not have to be both.

The transcripts were also run through *AntConc* (http://www.laurenceanthony.net/antconc_index.html), a concordancing and word counting (types and tokens) application, to identify the lexical resources the various speakers used, and through *Compleat Lexical Tutor* (http://www.lextutor.ca/), a corpus analysis tool, to establish the academic level of the words used. These quantitative results, both of the full discourse data and of the parentheticals alone, were compared between speakers to establish patterns of usage. Our analyses aimed to reveal differences in parenthetical prosody and information between NTAs and ITAs.

Results

Prosodic Analysis (RQ #1). All TAs (NTAs and ITAs) used prosodic parentheticals as one strategy to teach their classes. All of the TAs taught interactively, that is, they knew what content they intended to cover, but did not necessarily plan in detail what they would say. This suggests that their frequent use of parentheticals served important purposes in achieving their main goals, the communication of course content through an interactive exchange with the students. This gives a clue to a primary function of parentheticals. They are a way that the teacher negotiates a developing classroom understanding.

We looked at three main uses of prosodically marked parentheticals: Regulatory uses, interpersonal connections, and making connections to content. These categories grew out of our listening to and classifying the prosodically marked parentheticals. We have chosen to unify our analysis by using functionally oriented titles to help us understand why parentheticals are used in the classroom context. We have not addressed all uses of parentheticals that we discovered, but only those that were most frequent across a number of TAs, both NTAs and ITAs. In addition, we do not provide pitch tracings as evidence, primarily because the length of many parentheticals and the noisy recording quality of the classroom setting made this difficult.

Regulatory parentheticals. The first use of parentheticals was regulatory, including comments about the classroom context, self-correction, and the use of tags. All TAs used parentheticals to com-

ment on the classroom context, often about something that they noticed in the process of teaching, e.g., Ellen's (NTA) use of *we'll begin again with* <u>*oh I didn't change the slide um*</u>, when she noticed her presentation was at the wrong place, when writing on the board (e.g., Ajith's (ITA) *point two five plus x*, <u>*let's do that, point two five plus x*</u>, or in giving the reasons for an action, as in (3) from Amy.

(3) so I'll … give these back to you, when you are taking the other quiz, <u>so we're not wasting time in class.</u>

A very common regulatory use of parentheticals was question tags. Kaltenböck (2006) included question tags in his syntactic taxonomy of parentheticals. Question tags in our data set were usually *(al)right?* and *(o)kay?* TAs used tags primarily to move the discourse along while maintaining their connection to the students, and at the same time making the exposition of content less dense.

Chemistry TAs frequently used tags, whereas tags were less frequent overall for English TAs. This may be because the chemistry recitations were content-heavy, working through problems and graphs of specific chemical processes while preparing for a quiz over these concepts. The English classes, in contrast, were less content-heavy. In addition, student participation in the chemistry classes was restricted to fairly quick responses to TA questions, while the students in the English classes engaged in more extensive discussion. Tags seemed to be most frequently employed when the TA was explaining a concept without expecting discussion. The tags had a different intonation pattern (high-rise) than other parentheticals, but unlike other rising tags in English, a response was neither expected nor appropriate. Tags were used to continue the discourse, and to engage and encourage. In the next example, a chemistry ITA uses *right* repeatedly. The intonation of *right* is always a quick, quiet, high-rise. The final use of *Right** is, in contrast, said with long, falling intonation.

Example: (This chemistry TA engaged in a lot of rapid fire type questioning.)

TA: ...what kind of an acid formic acid is? Is it a strong acid or a weak acid?

Student:	It's a weak acid.
TA:	It's a weak acid, right? How does it split up? If I have formic acid, HCOH. How does it split up? What are the ions formed?
Student:	HCO negative.
TA:	HCO negative. And?
Student:	H plus.
TA:	H plus, right? Good. So this makes it an acid, right? H plus makes it an acid. But what hap pens when I split up HCOONa? Sodium for mate. Is sodium formate an acid or a base or a salt?
Students:	Salt/It's a salt.
TA:	It's a salt, right? So you, this is a weak acid and you have the salt of a weak acid, right? Right*.

Prosodically, parentheticals are normally described as low and either flat or slightly rising in pitch (Bolinger, 1989). In our data set, the question tags did indeed "feel" parenthetical, but they were often high, quiet and slightly rising. The only consistently different thing in terms of prosody was that for most ITAs, the tag was not always quieter, and therefore did not provide as much of a contrast with the rest of the discourse as they did for NTAs.

Interpersonal parentheticals. Parentheticals were also used to promote interpersonal connections between teachers and students. These took a wide variety of forms, from Amy's (NTA) *I gave you that point just because I know that's what you guys like* to Pete's (NTA) playful recognition of an answer (*and that's right correct thank you some audience participation*) to Feng's (ITA) mild warning about using inappropriate sources (*a lot of you used articles um from the websites and with unknown um author that's not really nice*).

These interpersonal connections sometimes led to unpredictable tangents that introduced topics that connected to popular culture, as in Amy's (NTA) spontaneous use of humor in connecting her first statement to a line from the movie *Mulan*, followed by noticing the wrist recorder in the midst of explaining a concept in (4).

(4) so let's get down to business, not to defeat the Huns, but to talk about some buffers, I got a I got a couple laughs - I think

I'm funny okay. So let's start with this, so you have a buffer it has propionic acid [notices recorder] I'm a power ranger today this is kind of cool, right

Amy's contrasts in prosody are striking in this example. She starts with a strongly projected voice including extra high pitch, then drops to a quieter, lower-pitched parenthetical with a slight following pause, then back to strongly projected speech with emphatically stressed syllables, then a lower pitched, modulated voice quality that continues even when she says the *right* of the host sentence. Thus the low-pitched prosody of the parenthetical continues when she says *right*, but informationally *right* acts as a transition back to the topic of buffers, and so we considered it part of the host sentence.

Another interpersonal way in which parentheticals were used was to encourage student responses, as in Ellen's (NTA) solicitation of non-verbal responses in the midst of non-parenthetical content.

(5) your intake of food and what you believe about food affects lot of different areas of your life, right, is that true? Some nods, Brenda a nod. How is it true for you, or how do you see that? you're just nodding cause it felt good um

Lihua (ITA) repeated questions regularly with parenthetical prosody to elicit responses when they were not immediately forthcoming, as in this sequence during observation and discussion of a complex graphic.

(6) the width of two streams, so size contrasts, anything else, anything else besides the size contrasts, what else, what kind of element help you to pick out the story

In a particularly striking use of a whispered parenthetical (in **bold**), Amy (NTA) encouraged a response from a particular student who was looking in the wrong place for the answer. The parenthetical was so quiet that one of the researchers did not hear it at first, yet its effect was an almost immediate answer from the student.

(7) what this equation tells you is there are two distinct factors that contribute to your PH, right, so what are the two, accord-

ing to this equation, what two things will change the PH. [three second pause] **Just look at the equation**

In all these cases, TAs used prosody to encourage a response. The parenthetical marking seemed less insistent to us, and its effect in the speech of a content-engaged TA was almost always a student response.

Finally, TAs used vocatives to create interpersonal connections in calling on students. Vocatives are included as a subcategory of noun phrases as parentheticals within Kaltenböck's (2006) taxonomy. In teaching, the use of names is an important interpersonal tool. Vocatives in teaching tend not to be tied to a host sentence much of the time. Rather, they are their own phrase, and they often carry the function of calling on, or acknowledging students. Because names are generally optional within this context, they were said quietly, with a low, flat pitch, and possibly with a slight rise at the end. Vocatives were often used to call on a volunteer, so the student first had to indicate a willingness to be called on. The invitation was given with the student's name or with a simple nod with the word *yes* in some form.

In our data, while the actual use of noun phrases was limited to students' names and *you guys* by NTAs and, once, *guys* by an ITA, there were, additionally, numerous times that students were simply called on with *yeah?, yeah you?, again?,* and *yes?* These all were said with the characteristic parenthetical prosody and were invariably accompanied by inviting body language such as a head nod. It is interesting to note that, like the use of actual nouns, these were almost entirely used by NTAs and seldom by ITAs. The use of vocatives by NTAs but not ITAs is another example of the greater ease with which NTAs interact with students. "Calling on/acknowledging" seems to be tied to the way the information is delivered and the types of questions asked. ITA interaction was almost entirely characterized by explanation mixed in with clear sequences of questions that generally had right or wrong answers. These questions were given to the whole class and responded to by anyone. NTAs were more likely to ask less exacting questions, and to wait longer for responses, looking around for willing volunteers and then calling on them.

Almost all the TAs (NTAs and ITAs) used prosodic parentheticals

to achieve interpersonal ends. This was consistent with what we noticed in our earlier study (Levis, Levis & Slater, 2012). Parentheticals are a way in which teachers negotiate classroom relationships with their students.

Content-connecting parentheticals. Another common use for prosodic parentheticals was to call attention to connections to course content. Thus TAs called attention to what had been covered already, what was going to be covered, and real-world content. All TAs did this, although NTAs more extensively than ITAs. Tim referred to previous course content, e.g., *we have a lot of information that could be written in a paragraph but we've talked about before in the last couple weeks that we also want to account for different types of readers*; future course content, e.g., *it's making it clear to our readers that we're not trying to lie to them uh were in a coup- in an example in a little bit we might see why that might be a problem*; and outside connections, e.g., *and it was actually really difficult to find unethical data data displays so I think um I think people are doing doing a much better job than we used to*.

Other TAs used parenthetical references to course content more restrictively, to refer only to topics of immediate interest (but not outside applications of the topic). Ajith, in reviewing chemical titrations said *and the KA value is given how will you find the PH A-minus by HA right that's Henderson Hasselbach equation* while Feng discussed feedback on writing (*so before I return your papers to you I'd just like to give some comments um on our last paper um let's see some of my feedback is here*).

Some TAs went beyond the course content to make spontaneous connections to outside examples or the larger culture. Ellen, in discussing organic food choices said *there's a whole sort of lifestyle right that seems to go along with it I don't know if any of you all have been paying attention to the whole Gwyneth Paltrow Chris Martin break up but a lot of what is getting talked about is her diet in terms of the reasons for their breaking up*.

The use of prosodic parentheticals to connect course content with past, present, and future information relevant to the content was common to all NTAs. There was no indication that these connections were planned beforehand, so the parentheticals were a way in which the speakers created cohesion between the immediate context, the larger context of the course, and popular culture. All TAs used paren-

theticals, but there was individual variation in how they made these connections. This makes parentheticals another interesting feature of instructional discourse (see also Smith, 2012 for other features).

Summary of results for RQ #1. To summarize (Table 4), NTAs and ITAs both used prosody for parentheticals, but not identically.

Table 4. Purpose and Pronunciation of Prosodic Parentheticals

		NTAs	**ITAs**
Parenthetical purpose	Regulatory	Yes	Yes
		Regulatory uses common from NTAs and ITAs. Tags heavily used by both groups, more commonly in STEM classes.	
	Interpersonal	Yes	No
		Widely used by NTAs. Rare for ITAs, even for vocatives.	
	Content-connected	Yes	Sometimes
		NTAs connected widely to course content and outside content. ITAs' connections were restricted to the direct content under discussion.	
Parenthetical prosody	Lower pitch	Yes	No
		Pitch was typically lowered by NTAs. ITAs had more limited pitch range differentiation. Tags for both groups usually had higher pitch with lower volume.	
	Lower volume	Yes	Sometimes
		NTAs consistently used lower volume on parentheticals. Some ITAs used lower volume as a primary cue, but others had little difference in volume from non-parenthetical language.	
	Increased tempo	Sometimes	No
		This was variable for NTAs, who sometimes spoke faster but not always; tempo changes were rare for ITAs when comparing host sentence tempo with parenthetical tempo.	

In general, NTAs used a wider variety of parentheticals and used multiple prosodic markers (lower pitch, lower volume and sometime faster tempo). ITAs were more limited in their use of parentheticals, using them primarily for regulatory functions, but they did not use them for interpersonal uses such as vocatives that connected them to their students. The only prosodic feature mark-

ing ITAs' parentheticals was decreased volume. They did not use pitch to differentiate parentheticals from host sentences, nor did they manipulate tempo. In addition, their use of parentheticals was simply not as frequent, except in the use of question tags.

Results of the Information Analysis (RQ #2). Parentheticals do not need to be marked prosodically to be parentheticals. An examination of the written transcripts alone showed that NTAs uttered parenthetical information more often than the ITAs, using strong and subtle resources within parentheticals. This section describes these resources, and how they differ in use between NTAs and ITAs. We work first from a quantitative angle in which lexico-grammatical resources from the interpersonal and ideational metafunctions are addressed, and then from a thematic approach, in which functional categories are identified and classified.

Quantitative results: Interpersonal metafunctions. The interpersonal metafunction considers the meaning-making resources we have and use to enact roles and relationships between speakers and audiences. To compare interpersonal differences between the NTAs and the ITAs, we examined resources that are typical of this metafunction, first by identifying them and using the concordancing software *AntConc* to count tokens and types. We then divided these resources into two categories: 1. ones that involved the audience; and 2. ones that created a stance. Involving the audience typically uses resources such as vocatives (names), appeals to others (e.g., *as X said*), pronoun use (e.g., *we* versus *you*), grammatical structure choice (e.g., imperatives or questions), and confirmation seeking (e.g., *right?*). Creating a stance involves the use of certain processes involved with knowing and thinking, modal verbs (e.g., *can, will*), modal adjuncts (e.g., *probably, maybe, really, very*), and appraisal lexis (e.g., *wrong, fine, crazy, reasonable*).

For confirmation seeks, imperatives, and questions, the patterns of use were not different between the two groups, whereas the other categories suggested that even parenthetically, the NTAs appeared to involve their audience more than the ITAs did. See Table 5. First, NTAs used vocatives more. Although at times they called individuals by name at these times, such as Ellen saying *Bella, a nod?* most of the time the NTAs used *you guys* to address their audience. There was only one occasion of vocatives being used by ITAs, and this was *guys*. Related to this, and within the English content area

only (no examples were found in the chemistry parenthetical data), the NTAs occasionally made appeals to others (*as X claimed* or *as Y said*), both outside of class (i.e., *a scholar in the field*) and inside class (i.e., *a student*), but the ITAs' parentheticals offered nothing similar.

Pronoun use within parentheticals was very different between the NTAs and the ITAs. The NTAs used *we* more, including themselves with their audience, rather than focusing on either the students (*you*) or themselves (*I*). This was also a finding in earlier work comparing NTAs and ITAs (Levis et al, 2012). The ITAs used *I* most frequently, followed by *you*, and finally least often, *we*. This finding supports earlier work on the patterns of pronoun use for Indian-subcontinent TAs found in Levis et al (2012).

In the present study, with regards to creating a stance, the ITAs, specifically the English-content ITAs, used *think* more than twice as often as the NTAs in parenthetical speech, and uttered *know* less than half as often. Non-parenthetically, both NTAs and ITAs used *think* and *know* about the same number of times. Moreover, when adjusted to tokens per 100, the ITAs used more examples of appraisal lexis, modal verbs, and modal adjuncts than did the NTAs, but the types were much more limited in number. The negatively tagged word *wrong* was the most common appraisal word in the chemistry-content ITA's parentheticals, and the positively tagged *fine* was the most used in the English ITA's parentheticals. A similar pattern held for modal verbs, with ITAs in general preferring *will*, as Levis et al (2012) found. The modal adjunct *just* was the most commonly used in chemistry and *probably* the most common in English. When taken all together, the use of these stance features can make the ITAs come across as sounding more unmoving and judgmental than the NTAs. Combine this with the lack of inclusion of the audience, and the result can lead to an interpretation of a TA who is "all business."

Quantitative results: Ideational metafunctions. Examining the ideational resources that each group used in general would not reveal much, as the TAs were teaching two vastly different subject areas (chemistry and English). We instead set about looking at the use of vocabulary that is related specifically to an academic content area in contrast to everyday language. To examine this across disciplines, we ran the transcripts through the *Compleat Lexical Tutor* (http://www.lextutor.ca) to explore the kinds of words that the TAs

were using in their parentheticals (Table 5). The *Compleat Lexical Tutor* classifies words according to frequency in corpus analyses of written texts (see Laufer & Nation, 1995): the first 1,000 most frequent words in English, or K1; the second 1,000 most frequent, or K2; the *Academic Word List* (*AWL*) (those words which are frequent only in academic contexts); and *Off-list Words*, which are not on the other three lists. In other words, *Off-list Words* are less frequent than the top 2,000 words, and are not commonly used in general academic contexts). The K1 and K2 lists represent almost 85% of the vocabulary used in normal written English. The lists are used as a measure of lexical density.

Table 5. Vocabulary Analysis by L1 and Utterance Type

	ITA		**NTA**	
	Non-Parenthetical	**Parenthetical**	**Non-Parenthetical**	**Parenthetical**
Tokens	29,683	484	29,881	2,862
Types	2,003	205	2,195	610
Type-token	0.07	0.42	0.07	0.21
Tokens per type	14.82	2.36	13.61	4.69
Lexical density	0.47	0.45	0.46	0.45
K1 words: Function Content Ratio F:C	24,407 82.23% 15,672 52.80% 8,735 29.43% 1.79:1	429 88.64% 265 54.75% 164 33.88% 1.62:1	24,323 81.40% 16,284 54.50% 8,039 26.90% 2.03:1	2,484 86.79% 1,587 55.45% 897 31.34% 1.77:1
K2 words	976 3.29%	21 4.34%	1,044 3.49%	98 3.42%
K1 + K2	85.52%	92.98%	84.89%	90.21%
AWL words	1,445 4.87%	7 1.45%	1,109 3.71%	71 2.48%
Off-list Words	2,855 9.62%	27 5.58%	3,405 11.40%	209 7.30%
AWL + *Off-list*	4,300 14.48%	34 7.02%	4,514 15.11%	280 9.79%

Note: *Compleat Lexical Tutor* analysis gave information both about the total number of words (the total number of tokens) and about how often each word occurred (the total number of types). Thus, if one particular word occurred 15 times in the transcript, the analysis would say there was one type with 15 tokens.

Research question 2 asked about differences in uses of infor-

mational parentheticals by NTAs and ITAs. The vocabulary that the TAs used gives us information about how technical the language is in the parentheticals and in the non-parentheticals. NTAs used marginally more words in their parentheticals from the *Academic Word List* (*AWL*) and the *Off-list Words* than the ITAs did, although in the full dataset, ITAs used more words from the *AWL* than did the NTAs.

As expected, the chemistry-content ITAs used more *Off-list Words* than did the English-content ITAs (because the chemistry content has more specialized vocabulary than does the English vocabulary), and the English-content ITAs used more *AWL* words than the chemistry-content ITAs (Table 6). What was interesting was that the English-content NTAs used more words from the *AWL* and *Off-list Words* than the chemistry-content NTAs, suggesting that the NTAs in the chemistry classes may have been attempting to make their recitations more listener-friendly by making the course content less dense and connecting specialized terms to everyday vocabulary. See Table 6.

Table 6. Vocabulary Analysis by Discipline and NTA/ITA Status

	ITA		NTA	
	ENGL	**CHEM**	**ENGL**	**CHEM**
Tokens	259	225	1,231	1,630
Types	133	115	403	374
Type-token	0.51	0.51	0.33	0.23
Tokens per type	1.95	1.96	3.05	4.36
Lex density	0.44	0.46	0.47	0.43
K1 words: Function Content Ratio F:C	231 89.19% 144 55.60% 87 33.59% 1.79:1	198 88.00% 121 53.78% 77 34.22% 1.62:1	1,043 84.73% 649 52.72% 394 32.01% 2.03:1	1,439 88.28% 936 57.42% 503 30.86% 1.77:1
K2 words	14 5.41%	7 3.11%	46 3.74%	52 3.19%
K1 + K2	94.60%	91.11%	88.47%	91.47%
AWL words	5 1.93%	2 .89%	41 3.33%	30 1.84%
Off-list Words	9 3.47%	18 8.00%	101 8.20%	109 6.69%
AWL + Off-list	14 5.4%	20 8.89%	142 11.53%	139 8.53%

Finally, the ratio of function to content words was marginally greater for NTAs than for ITAs. This suggests that the discourse for ITAs was slightly denser, with relatively more content words than function words packed in. Even though the content words the ITAs used were more common (i.e., from the list of the most frequent 1000 words), there were more of them, and thus when combined with the interpersonal features noted above, the ITAs' language may come across as being more dense, even if they are parenthetical, that is, not specific to the content being taught (Table 6).

Thematic analyses and results. Turning to the thematic approach in which functional categories were examined, we found that NTAs generally used more function categories than their ITA peers and in longer stretches of discourse. The use of these functional categories, defined earlier (see Table 2) as projection (e.g., *I think that... he said that...*), elaboration (clarification, restatement), extension (addition, contrast), enhancement (qualification, modification), and monitoring (checking that the audience is following) will be examined in turn using illustrations from the discourse data, focusing on the parenthetical utterances identified by reading the transcriptions.

Projection. By looking at the quantitative measures as above, we can see that both ITAs and NTAs used projection parenthetically, with ITAs using "think" to project information more often than NTAs (based on tokens per 100), and NTAs using "know" more often. The following examples illustrate this usage:

Feng (ITA): You could choose your PowerPoint slides. Um brochure—I don't **think** that we designed any brochure in this section—so PowerPoint slides is obviously the only option that you could have.

Amy (NTA): If you were given the KSP for this particular salt—which I don't actually **know** what it is. We'll just pretend that it's—oh that's probably really wrong but pretend this is the KSP for this salt—How would you find the molar solubility of either one of these ions?

Notice also how the NTAs appear generally to use these sensing verbs in somewhat longer parenthetical utterances, which in

fact contain more than one proposition. For example, Amy (NTA) has multiple parenthetical propositions, admitting that she doesn't know what the KSP was, suggesting that the class as a whole (including her) pretend that the number she has offered is a possible KSP, then confirms that the number is probably not the best choice as an example. ITA Feng, on the other hand, used sensing verbs to offer single propositions, making the parenthetical information appear shorter.

Elaboration. All speakers used elaboration in their parenthetical speech to clarify, restate, or exemplify the main line of content in some way, and both used this elaboration in very similar ways, as the following examples illustrate:

Tim (NTA): Since most of these are RFPs for local communities, we're assuming that—uh this might be in like a city hall uh setting or something like that—they've also asked citizens of the community to come along.

Ajith (ITA): How do you find the PH?—Yeah. What is wrong here? I have done something wrong? Is the equation balanced? No what is wrong? Is the water here? It is water. Yeah, then alright. Sorry. Yeah—How do you find the PH?

When functioning as an elaboration, ITAs' parentheticals such as Ajith's example, were at times quite long with multiple propositions. Not using a sensing verb such as "think" to alert the listener to the parenthetical status could make it difficult for the audience to interpret the status of the utterances unless they are marked as parenthetical in some other way, such as prosodically (in which ITAs were inconsistent), or by a shift to the first person (*I* or *we*), as Ajith did. Tim's strategy was to identify the information as an elaboration by using the modal *might* and highlighting that it is an example through his use of *or something like that*.

Of all the teaching assistants, NTA Amy appeared to have the largest range of resources to show she was elaborating parenthetically. Not only did she indicate examples by introducing them with projections such as *we'll just say* or *for example*, she also used subject nominal clauses, as in the following:

Amy (NTA): What is the PH of the solution—is what we want to find out. All right so—There are two ways to do this.

She also brought students' attention to examples on the board, as in *those are from here* and restated a long stretch of lecture with what appeared to be a parenthetical *there you go* or *that is how a buffer works*, and she clarified a problem-solving effort with *now that makes sense*. Most examples of NTA parentheticals clearly stated that they were elaborating or clarifying through examples or explicit restatements, whereas the ITA elaborations were not always clearly articulated.

Extension. The ITAs used the functional category of extension, which adds to or contrasts with information in the main line of content, much less frequently than did the NTAs. When the ITAs' parentheticals involved single propositions, the identification of the utterance as parenthetical did not come across as problematic, such as in Hamed's example:

Hamed (ITA): Please uh try to be there early—like ten minutes earlier—for the exam.

Yet when more than one proposition was included in an effort to extend the information, as in Lihua's utterance below, the resulting parenthetical could leave the audience struggling with whether the information is important or not. The parenthetical content offers related information that may require prosodic marking to clarify its informational importance, as with this example:

Lihua (ITA): But the officials look at report—which is really complicated and technical and most of the NASA officials they may not know about the technical details and probably most of the them are not engineers at all and probably politician so—when they look the report and read the graph…

The NTAs frequently signaled their extensions with *and* and their contrasts with lexical markers such as *although* or *but*. Some-

times these were interjected as single parenthetical words and sometimes as longer stretches, as in the following:

Tim (NTA): We have uh some of the East Asian countries—Japan Korean China—that that don't have as high of an obesity rate—though I would uh based on recent data in the last year I think there there's a lot of data showing that China would actually be uh be higher at this point—but yeah based on based on this data we can see that…

Note that Tim's first parenthetical is elaboration but the second is enhancement, combining different types of functions in the same chunk of information. Lihua attempts similar extension above, but she repeats the same syntactic structure, coordination, whereas Tim's use of subordination and projection helps organize the information in the parenthetical in a clearer manner, potentially helping the audience see the hierarchy better. A detailed discussion of this phenomenon is beyond the scope of this chapter. For a fuller discussion, see Tyler, 1992.

Enhancement. Both ITAs and NTAs uttered parentheticals that showed enhancement, qualifying their utterances using detail that showed condition or cause in some way. The NTAs frequently had longer parenthetical examples or combined functions of parentheticals within the same host utterance, as in:

Ellen (NTA): You can still use that—I just stole it as an example cuz it was the first thing that popped into my head—All right so once you have your confusing thing idea your confusing ad…

Lihua (ITA): But if you look at North Dakota nobody got shot—it's probably because nobody lives there—but anyway it concentrates on the east part of the country.

Monitoring. The most striking difference between NTAs and ITAs with regards to these thematic categories within parentheti-

cals was in the use of the monitoring function. Whereas examples of monitoring were rare in the speech of the ITAs, there were many examples of NTAs using parentheticals explicitly and implicitly to comment about whether their audiences were following along:

Amy (NTA): …to four point eight one—okay I got nods. Okay. Cool—So again just as we have expected. Increase.

Peter (NTA): So for those of you who do have your book, let's see, it is number seventeen forty-four that I think happens to be on page seven forty-four—I hear approximately three books turning pages so it makes me very happy I guess—So let's see. So this problem says…

The NTAs' parenthetical speech which monitored also included questions (e.g., *Can everybody read the country names?*), tag questions (e.g., *I think that was last semester, wasn't it?*), and confirmation checks (*Okay? Right?*). The closest similar monitoring parentheticals from the ITAs were shorter and more directly related to the content being presented, distinguishing them from the NTA examples:

Lihua (ITA): I mean we looked at one of the example—if you remember—sitting is killing you.

Ajith (ITA): I'm going to take point one five moles of propionate sodium
propionic so C2H5C—ignore the names if you're uncomfortable—so I have propionic acid point oh one five moles.

Moreover, the ITAs at times used monitoring parentheticals to make assumptions about what their students brought to their understandings in the class:

Lihua (ITA): Is that correlated with regulations of guns in the States? Probably. Do you know about the regulations of states?—
Probably you're not familiar with—but if you

look closely, do a little research, then you probably know that that there is might be a correlation.

Ajith (ITA): If this is the result—I know you have trouble in calculating them but—if this is the result…

Such assumptions were also noted in Levis, Levis, and Slater (2012) by the ITAs, who used this strategy to attempt to make connections with their audience; and they often do this as parenthetical interruptions to the main content being taught.

Implications for ITA Teaching

Learning is a complex phenomenon that involves taking in new information and connecting it with what you already know, that is, information that is given. In order to facilitate this, teachers need to present information in learnable chunks and help students make connections. This involves breaking up important content so that learners are not overwhelmed, and we argue that one way teaching assistants (TAs), and other instructors can do this is by using parentheticals. We have identified a number of both simple and complex uses of parentheticals in a two disciplinary teaching contexts. Not all are crucial. However, there are some suggestions that arise from this study that can benefit TAs.

Suggestion #1: Using lower pitch and quieter utterances to more clearly mark parentheticals. Both NTAs and ITAs will help their students learn if they employ parenthetical information and prosody to break up the density of information. They can use standard parentheticals such as *for example* and *okay*? But such short parentheticals may be harder for their students to separate from the main line of information than longer utterances that have multiple propositions. ITAs in particular could benefit from using lower pitch in quieter utterances that either point back to information students have already learned, or point forward to something they are going to discuss in the near future.

Suggestion #2: Using more inclusive language (*we, us, I*) in parentheticals. ITAs should also understand the importance of connecting to their audience. While connecting the students to content is arguably the most obvious element in a class, interper-

sonal connection is also extremely important. One advantage TAs have over professors is that they are in a position to be less remote because of age and context. Usually their discussion, recitation, or lab sections consist of 20 to 30 students, and yet are expected to be interactive. All TAs in our study did an admirable job of being interactive in their classes. However, NTAs more successfully established interpersonal connections with the simple parenthetical use of vocatives (especially calling on students using their names) and the personal pronouns *we, us,* and *I.* Using the inclusive *we* rather than an exclusive *you* invited the listeners into the lesson. ITAs would be wise to make use of these simple strategies so that they do not come across as unmoving and overly knowledgeable in stance.

Suggestion #3: Using parentheticals to comment on self and classroom events to connect to students. In addition, ITAs can use parentheticals to ask questions, to comment on and encourage student responses to questions, or to make short personal but harmless comments about themselves or a student (such as the NTA's parenthetical comment to a student in an awkward spot in the room, *sorry, you're stuck in the screen*). Such use of parenthetical language helps make the lesson come across as less dense and more understandable, and can make the TA appear more approachable. The power of interpersonal connectedness in large universities goes beyond the classroom atmosphere. It also makes it easier for students to visit their TAs in office hours, a proven activity to increase student success.

Conclusion

TAs (both NTAs and ITAs) in this study used parentheticals frequently. Their parentheticals served varied purposes, had varied syntactic structures, and were sometimes (but not invariably) marked prosodically. In short, they represent a "disparate and problematic range of phenomena" (Burton-Roberts, 2005, p. 179). But why use parentheticals at all? What communicative resources do parentheticals provide that the far better described "given and new information" in analyses of discourse do not? Part of the answer may come from Bing's (1980) classification of some parentheticals as being intonationally marked by what she called the "O-contour" (for "outside contour"). This type of intonation was to be interpreted outside the dominant intonational system, as part of a separate,

parallel system of meaning-making. The "inside" system is one in which syntax and prosody combine to mark information as "new" and "given." But as "outside" phenomena, parentheticals allow speakers to achieve other communicative goals such as providing online commentary on and adjustments to the discourse being created, connections between the current discourse and related content, and interpersonal involvement with the listeners.

Parentheticals as a significant parallel channel of classroom communication. Parentheticals appeared to provide a parallel channel serving as a commentary on the content and a way for the teacher to adjust, in real time, by providing background knowledge or connections that were not thought of before the time of speaking. In teaching situations where lectures are not fully written out, teachers constantly adjust to the classroom environment, to connections they had not intended to exploit, and to student responses. Parentheticals are one way in which teachers create coherence between the information they are presenting and the larger context in which the information is presented. The TAs referred back to previously discussed information from earlier classes, to content that was still to be covered, and to real-world connections that were not planned. Parentheticals then helped serve as a way to anchor the class in a wider context.

Parentheticals were also a way in which the TAs promoted interpersonal involvement with their students. The first job of any teacher is to effectively teach, whatever content or skill is in focus. But teachers also try to connect to their students' lives through humor, small talk, or a variety of other strategies. The value of face-to-face teaching must include the feeling that a teacher knows you personally, is engaged with you, and is not just delivering content. Parentheticals were a way to promote this kind of interpersonal involvement while keeping it separate from the primary content.

Parentheticals, both prosodic and non-prosodic, offered teachers way to monitor the class, elaborate and enhance content, and promote interpersonal involvement across the teacher-student divide. They point out that teachers are not simply "information transfer vehicles" but are guides to the content, helping students see connections that may even be surprising to the teachers themselves. There is little systematic research on parentheticals, especially in relationship to their use in classroom teaching and learning. Further

research is needed, particularly using approaches such as stimulated recalls that can explore and make explicit why instructors use parentheticals in their teaching, or even how much instructors are aware of their use of parentheticals.

In a Nutshell

1. Teachers need to help students understand which information is more important and which is less important. This happens through vocabulary and grammatical choices, but it also happens through prosody, or suprasegmentals.
2. Teachers call attention to important information, but they also use parentheticals to mark levels of importance of information and interpersonal connections. This is signaled by information changes and special prosody.
3. We examined NTA and ITA use of parentheticals in STEM and non-STEM teaching.
4. NTAs made a greater use of parentheticals than did ITAs, with differences in grammar, vocabulary and prosody.
5. The TAs seemed to use parentheticals to create a parallel information track in which they commented on content, made connections, regulated their own and student interaction, and promoted interpersonal involvement.
6. Not all uses of parentheticals are appropriate for ITA training. But some, especially the use of tags, vocatives, and inclusive language (e.g., we vs. you), should be employed by all TAs.
7. Parentheticals are an important way for teachers to be more than information-transfer machines, and to develop interpersonal connections with students.

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